WE CLAIM:

1. A method of forming an intermediate compound for preparing a target compound with different functionality comprising:

(a) preparing two or more protection groups comprising building block units linked together;

(b) forming a protected compound comprising two or more protection groups, wherein at least two of the protection groups contain a different number of building block units;

(b) removing a terminal building block unit of each protection group using one or more chemical, electrochemical, or photolytic reactions; and

(c) consecutively removing an additional building block unit on each remaining protection group.

2. The method of claim 1, wherein the building block units of the protection groups are linked by a C-X-C bond where X is NR, O, S, SiR_2, C≡C, O-SiR_2-O, PR, O-PO-O, O-PO_2-O, CONR, O-CO-O, NR-CO-O, NR-CO-NR, O-$S(O_2)$, an orthoester, an acetal, a ketal or NR-$S(O_2)$; and R is hydrogen, an alkyl, an allyl, an alkene, an alkyne, an aryl, or an alkoxy group.

3. The method of claim 1, wherein the protection group building block units are linked by an amide bond.

4. The method of claim 1, wherein the protection group building block units are alpha, beta or gamma amino acid units.

5. The method of claim 4, wherein the amino acid units are *N*-substituted with a (C_1 to C_{10}) alkyl or aryl group.

6. The method of claim 5, wherein the amino acid units are *N*-substituted with a methyl, ethyl, isopropyl, sec-butyl, t-butyl, 3-pentyl, phenyl, benzyl, or halogenated derivatives thereof.

7. The method of claim 4, wherein the amino acid units are unsubstituted or substituted 2-amino benzoic acid or (2-amino-phenyl)-acetic acid.

8. The method of claim 4, wherein the amino acid unit is unsubstituted or substituted glycine, alanine, or alpha amino isobutyric acid.

9. The method of claim 8, wherein the amino acid is *N*-sec-butyl-glycine.

10. A method of preparing target compounds with different functionality comprising:

(a) preparing a protected template molecule consisting of:

(i) a template molecule having more than one functional group;

(ii) protection groups attached to more than one functional group of the template molecule, the protection groups comprising building block units linked together, wherein

(a') a first protection group has at least one building block unit; and

(b') at least one other protection group has more building block units than the first protection group;

(b) removing one or more building block units from each protection group using chemical, electrochemical, or photolytic reactions to form at least one exposed functional group of the template molecule that is not attached to a protection group; and

(c) reacting the exposed functional group of the template molecule with a first target group;

(d) consecutively removing additional building blocks from the protection groups using chemical, electrochemical, or photolytic reactions to form at least one additional exposed functional group of the template molecule that is not attached to a protection group; and

(e) consecutively reacting the additional exposed functional group with an additional target group.

11. The method of claim 10, wherein the building block units of the protection groups are linked by a C-X-C bond where X is NR, O, S, SiR_2, C≡C, O-SiR_2-O, PR, O-PO-O, O-PO_2-O, CONR, O-CO-O, NR-CO-O, NR-CO-NR, O-$S(O_2)$, an orthoester, an acetal, a ketal or NR-$S(O_2)$; and R is hydrogen, an alkyl, an allyl, an alkene, an alkyne, an aryl, or an alkoxy group.

12. The method of claim 10, wherein the protection group building block units are linked by an amide bond.

13. The method of claim 10, wherein the protection groups are oligomers of *N*-sec-butyl-glycine.

14. The method of claim 10, wherein the template molecule has functional groups selected from the group consisting of an amine, an amide a hydroxyl, a thiol, a carboxylate, or a mixture thereof.

15. The method of claim 10, wherein the template molecule is an oligopeptide, an oligosaccharide or a DNA fragment.

16. The method of claim 10, wherein one of the functional groups of the template molecule is attached to a resin.

17. The method of claim 10, wherein the template is a solid substrate.

18. The method of claim 17, wherein the solid substrate is a glass.

19. The method of claim 17, wherein the solid substrate is a polymer containing functional groups selected from the group consisting of hydroxyl, carboxylate, amino, and combinations thereof.

20. A compound consisting of:

(a) a template molecule having more than one functional group;

(b) protection groups attached to more than one functional group of the template molecule, the protection groups comprising building block units linked together, wherein

(i) a first protection group has at least one building block unit; and

(ii) at least one other protection group has more building block units than the first protection group.

21. The compound of claim 20, wherein the template molecule has functional groups selected from the group consisting of an amine, an amide a hydroxyl, a thiol, a carboxylate, or a mixture thereof.

22. The compound of claim 20, wherein the template molecule is an oligopeptide, an oligosaccharide or a DNA fragment.

23. The compound of claim 20, wherein the protection group are oligomers of *N*-sec-butyl-glycine.

24. The compound of claim 20, wherein the protection groups are unsubstituted or substituted oligomers of 2-amino benzoic acid.

25. The compound of claim 20, wherein the protection groups are unsubstituted or substituted oligomers of (2-amino-phenyl)-acetic acid.

26. The compound of claim 20, wherein the protection groups are oligomers of *N*-(1-isopropyl-2-methyl-propylamino)acetic acid.

27. The compound of claim 20, wherein the protection groups are oligomers of *N*-(1-ethyl-propylamino acid).

28. A compound prepared according to the method of claim 10.

29. A multiple antigen peptide prepared according the method of claim 10.

30. The multiple antigen peptide of claim 29, wherein the template molecule is a peptide chain and the target groups are two or more antigens.

31. The multiple antigen peptide of claim 29, wherein the template molecule is a peptide chain and at least one of the target groups is a T-cell determinant from a human, parasitic, bacterial, or viral protein.

32. The multiple antigen peptide of claim 29, wherein the template is a peptide chain and at least one of the target groups is a B-cell determinant from a human, parasitic, bacterial, or viral protein.

33. A de novo protein prepared according to the method of claim 10.

34. The de novo protein of claim 33, wherein the template is a cyclic peptide and functional secondary structures are attached to form a folded structure.

35. The de novo protein of claim 34, wherein the secondary structure includes a α helix.

36. The de novo protein of claim 34, wherein the secondary structure includes β sheets.

37. The de novo protein of claim 34, wherein the secondary structure contains a catalytic triad.

38. A method of using protection groups to produce microarrays on a solid support comprising:

(a) forming two or more protection groups comprising building block units linked together;

(b) attaching the protection groups to the functional groups of a solid support at a multiple of distinct locations, wherein at least two of the protection group contain a different number of building block units;

(c) removing one or more building block units from each protection group using chemical, electrochemical, or photolytic reactions to form at least one exposed functional group on the solid support;

(d) reacting the exposed functional group of the solid support with a target group;

(e) consecutively removing additional building block units from the protection groups using chemical, electrochemical, or photolytic reactions to form at least one additional exposed functional group on the solid support; and

(f) consecutively reacting the additional exposed functional group of the solid support with additional target groups.

39. The use of claim 38, wherein the target groups are DNA arrays.

40. The use of claim 38, wherein the target groups are oligosaccharides arrays.

41. The use of claim 38, wherein the target groups are protein arrays.

42. The use of claim 38, wherein the target groups are antibody arrays.

43. The use of claim 38, wherein the target groups are useful for biomolecular screening.

44. The use of claim 38, wherein the solid support is a glass.

45. The use of claim 38, wherein the solid support is a polymer containing functional groups selected from the group consisting of hydroxyl, carboxylate, amino, and combinations thereof.

46. The use of claim 38, wherein the solid support is a coating, membrane, plate, particle, or bead.

47. A method for biomolecular screening comprising using microarrays on a solid support according to claim 38.